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Project Profile – Indoor Coliseum Structural Monitoring

Overview

The UNI-Dome, as it is commonly known, is a multi-purpose coliseum built in 1976 by the University of Northern Iowa, in the USA. The indoor facility is a 424-feet (128m) diameter domed structure seating approximately 16,500 for sporting events and 25,500 for concerts. For sports, it has an Astro-turf football surface that can be rolled up when not in use; a removable basketball court; and an all-purpose floor marked as a running track. The Dome is also used for concerts, community events such as recreational and craft shows, and commencement ceremonies.

The domed roof was originally made of fiberglass with a Teflon coating. Its inner layer assisted with the melting of snow and ice in the winter. For heavy snows, however, workers had to scoop snow off the roof by hand. The transparent roof permitted natural lighting during the day. Lights were installed and used for night events. The roof was supported by cables but suspended by air pressure. It had an electronic monitoring system to alert officials to any problems and was climate controlled to allow for year-round use.

Three times in its history the dome encountered major structural difficulties. On November 9, 1975, a mechanical failure in the fan system during a thunderstorm resulted in the slow deflation of the dome. When the fabric began to sag, water built up in those areas, causing the material to rip. The roof was re-inflated after repairs later that month. Another strong thunderstorm was the cause of the second deflation of the Dome. On June 30, 1977, high winds, rain, and a power failure caused the dome to deflate and later tear. And again, on December 9, 1994, an accumulation of water from melting snow and ice on the roof caused the material to tear along a seam. Strong winds then ripped a triangular hole in the material, which resulted in deflation. It was re-inflated December 19, 1994, after a replacement panel was installed.

In 1998, a hybrid roof system was installed to replace the air-supported roof. Stainless steel, standing seam roof panels, supported by structural metal deck and bar joists, form the skin of the peripheral area of the roof (75% of the roof area). The center 45,000ft^2 (4130sq^m) polygon is enclosed with an arch-supported, PTFE fabric tensile roof. The new roof system, further modified since the 1998 reconstruction, utilizes a snow-melting system to prevent snow from accumulating enough to damage the roof structure.

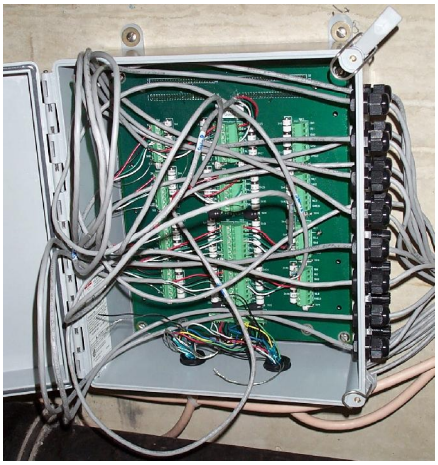
What We Did

CTL was contracted to design and install a structural monitoring system as part of the roof system retrofit. The structural monitoring system includes wind speed and direction sensors and 24 strain gages placed on key structural elements near the top of the roof.

We supplied a MultiLogger System to read the wind speed and direction sensors as well as the vibrating wire strain gages, connected to (2) Canary Systems MultiMux instrument multiplexers. MultiLogger software was also provided to facilitate programming of the system, monitoring, management of alarms and data collection.

The equipment supplied included a number of key features to support the requirements of the project, including the following:

- Alarms are entered into the MultiLogger channel configuration for each strain gage. If measurements exceed alarm values then a voice dialer is activated to alert key site personnel of the alarm condition.



- The Canary Systems VWDSP Vibrating Wire Interface was supplied to read the vibrating wire instrumentation, this provides for highly reliable measurements to avoid false alarm triggering.

- The MultiMux's were connected in DaisyMux configuration, allowing a single cable to connect both multiplexers to the system.

- The system is equipped with a Network Link Adaptor to facilitate access to the system via TCP/IP on the University's Local Area Network. MultiLogger is used to remotely manage the system from wherever an Internet connection is available, this avoids long-distance phone charges and provides a more reliable method for managing the system.

Who to Contact

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